

defined, the scheme must be implemented in order to realize the benefits thereof.

As may be recognized, travel arrangements made in connection with traveling on behalf of the organization may be set via a travel department of the organization, if one exists, or a travel agency of the organization. Accordingly, the implementation of the travel scheme requires that the travel department or travel agency be aware of the travel scheme, or at least the relevant portions of the travel scheme. For example, a travel agency setting travel arrangements for an employee wishing to travel the PHL-BRU link should at least be aware that carriers DA and SN are preferred. Additionally, the agency should be aware whether carriers BA or SN have already supplied the respective preferred number of travel trips 58 or 3, as determined by the solution values 88. As will be recognized, other information may be provided, preferably on a need to know basis.

In order that the travel agency be made aware of the necessary information from the travel scheme, the information must be communicated to the agency. Since a travel agency typically accesses travel information from a CRS 14 via a point of sale terminal (not shown), it is preferable that the information from the travel scheme be communicated from the computer system 10 to the travel agency point of sale terminal via the CRS 14.

The computer system and method described above may be employed by a travel agency to provide a travel optimization service to one or more organizations, and the travel agency may charge a fee to each organization for providing the service. As may be recognized, at least a portion of the fee may comprise a portion of the savings realized to the organization by employing the travel optimization service.

In the foregoing description, it can be seen that the present invention comprises a new and useful computer system and method for determining a travel scheme that minimizes the travel costs of an organization. It will be appreciated by those skilled in the art that changes could be made to the embodiment described above without departing from the broad inventive concepts thereof. It is understood, therefore, that this invention is not limited to the particular embodiment disclosed, but it is intended to cover modifications within the spirit and scope of the present invention as defined by the appended claims.

claim:

1. In a computer system having a data input device, a data storage device, and a processor, a method for determining a travel scheme for minimizing travel costs for an organization, where the organization expects to purchase travel trips for a plurality of travelers for a plurality of predetermined travel links, each travel link comprising a travel origin and a travel destination, each travel link being served by at least one of a plurality of travel carriers, the method comprising the steps of:

obtaining travel information relating to the carriers and the links via the data input device;
storing the travel information via the data storage device;
constructing an objective function from the travel information via the processor, the objective function representing a travel cost to the organization to purchase travel trips for the plurality of travelers for the plurality of predetermined links;

constructing a set of constraints from the travel information via the processor, the constraints comprising restrictions relating to the objective function;

applying the constraints to the objective function via the processor to determine a solution of the objective

function that satisfies the constraints and that minimizes the travel costs of the organization; and applying the solution as the travel scheme for minimizing travel costs by purchasing travel trips in accordance with the solution.

2. The computer system of claim 1 wherein the obtaining travel information step comprises the steps of:

obtaining travel cost information for each link for each carrier serving the link;

obtaining demand and supply information pertaining to a projected demand for each link and a projected supply for each carrier; and

obtaining carrier goal information pertaining to any predetermined goal the organization has with respect to any of the carriers.

3. The computer system of claim 2 wherein the processor determines from the travel cost information for each link for each carrier serving the link a weighted value representing an actual cost to the organization for traveling the link using the carrier.

4. The computer system of claim 3 wherein the objective function comprises the sum of a travel cost for each link, the travel cost for each link comprising the sum of a travel cost for each carrier serving the link, the travel cost for each carrier serving the link comprising the weighted value representing the actual cost to the organization for traveling the link using the carrier multiplied by a variable representing a number of trips to be purchased from the carrier for the link.

5. The computer system of claim 4 wherein the solution comprises a solution value for each variable.

6. The computer system of claim 5 wherein the processor determines lower and upper limits for each constraint, each constraint being adjustable between the limits while maintaining the determined solution.

7. The computer system of claim 5 wherein the processor determines lower and upper limits for each solution value, each solution value being adjustable between the limits while maintaining the determined solution.

8. The computer system of claim 4 wherein the constraints are derived from the demand and supply information and the carrier goal information, the constraints comprising link demand constraints, carrier supply constraints, and carrier goal constraints, the link demand constraints requiring that for each link the sum of the variables representing the number of trips to be purchased from all carriers for the link be equal to the projected demand for the link, each carrier supply constraint requiring that for a particular carrier the sum of the variables representing the number of trips to be purchased from the carrier for all links be in a predetermined range, each carrier goal constraint requiring that the goal the organization has with respect to a particular carrier be accomplished.

9. The computer system of claim 2 wherein the processor determines the obtained information in the form of a table.

10. The computer system of claim 9 wherein the processor organizes organizing each of the plurality of links in a first direction on the table and each of the plurality of carriers in a second direction on the table, each carrier serving each link being designated by a cell on the table having information pertaining to the carrier serving the link.

11. The computer system of claim 10 wherein the processor organizes the link demand information according to each link and the carrier supply information and carrier goal information according to each carrier.

12. The computer system of claim 11 wherein the processor employs linear programming to apply the constraints to the objective function to determine the solution.

13. The computer system of claim 12 wherein the processor organizes the solution in the form of a table corresponding to the table of the obtained information.

14. The computer system of claim 2 wherein the obtaining
5 travel cost information step comprises acquiring current travel data from a computerized reservation system.

15. The computer system of claim 2 wherein the obtaining travel cost information step comprises acquiring previously generated historical travel data from a historical travel data file.

16. The computer system of claim 2 wherein the obtaining demand and supply information and obtaining carrier goal information steps comprise acquiring the demand and supply information and the carrier goal information for the organization from a previously generated organization discount program data file.

17. The computer system of claim 1 wherein the processor employs linear programming to apply the constraints to the objective function to determine the solution.

18. A method for determining a travel scheme for minimizing travel costs for an organization, where the organization expects to purchase travel trips for a plurality of travelers for a plurality of predetermined travel links, each travel link comprising a travel origin and a travel destination, each travel link being served by at least one of a plurality of travel carriers, the method comprising the steps
25 of:

obtaining travel information relating to the carriers and the links;

30 constructing an objective function from the travel information, the objective function representing a travel cost to the organization to purchase travel trips for the plurality of travelers for the plurality of predetermined links;

35 constructing a set of constraints from the travel information, the constraints comprising restrictions relating to the objective function;

applying the constraints to the objective function to determine a solution of the objective function that satisfies the constraints and that minimizes the travel costs of the organization; and

40 applying the solution as the travel scheme for minimizing travel costs by purchasing travel trips in accordance with the solution.

19. The method of claim 18 wherein the obtaining travel
45 information step comprises the steps of:

obtaining travel cost information for each link for each carrier serving the link;

50 obtaining demand and supply information pertaining to a projected demand for each link and a projected supply for each carrier; and

obtaining carrier goal information pertaining to any predetermined goal the organization has with respect to any of the carriers.

20. The method of claim 19 further comprising the step of
55 determining from the travel cost information for each link for each carrier serving the link a weighted value representing an actual cost to the organization for traveling the link using the carrier.

21. The method of claim 20 wherein the objective function
60 comprises the sum of a travel cost for each link, the travel cost for each link comprising the sum of a travel cost for each carrier serving the link, the travel cost for each carrier serving the link comprising the weighted value representing the actual cost to the organization for traveling
65 the link using the carrier multiplied by a variable representing a number of trips to be purchased from the carrier for the link.

22. The method of claim 21 wherein the solution comprises a solution value for each variable.

23. The method of claim 22 further comprising the step of determining lower and upper limits for each constraint, each constraint being adjustable between the limits while maintaining the determined solution. 5

24. The method of claim 22 further comprising the step of determining lower and upper limits for each solution value, each solution value being adjustable between the limits while maintaining the determined solution. 10

25. The method of claim 21 wherein the constraints are derived from the demand and supply information and the carrier goal information, the constraints comprising link demand constraints, carrier supply constraints, and carrier goal constraints, the link demand constraints requiring that for each link the sum of the variables representing the number of trips to be purchased from all carriers for the link be equal to the projected demand for the link, each carrier supply constraint requiring that for a particular carrier the sum of the variables representing the number of trips to be purchased from the carrier for all links be in a predetermined range, each carrier goal constraint requiring that the goal the organization has with respect to a particular carrier be accomplished. 15 20

26. The method of claim 19 further comprising the step of organizing the obtained information in the form of a table. 25

27. The method of claim 26 wherein the organizing step comprises organizing each of the plurality of links in a first direction on the table and each of the plurality of carriers in a second direction on the table, each carrier serving each link being designated by a cell on the table having information pertaining to the carrier serving the link. 30

28. The method of claim 27 wherein the organizing step further comprises organizing the link demand information according to each link and the carrier supply information and the carrier goal information according to each carrier. 35

29. The method of claim 28 further comprising the step of employing linear programming to apply the constraints to the objective function to determine the solution. 40

30. The method of claim 29 further comprising the step of organizing the solution in the form of a table corresponding to the table of the obtained information. 45

31. The method of claim 19 wherein the obtaining travel cost information step comprises acquiring current travel data from a computerized reservation system.

32. The method of claim 19 wherein the obtaining travel cost information step comprises acquiring previously generated historical travel data from a historical travel data file. 50

33. The method of claim 19 wherein the obtaining demand and supply information and obtaining carrier goal information steps comprise acquiring the demand and supply information and the carrier goal information for the organization from a previously generated organization discount program data file. 55

34. The method of claim 18 further comprising the step of employing linear programming to apply the constraints to the objective function to determine the solution. 60

35. A computer system for determining a travel scheme for minimizing travel costs for an organization, where the organization expects to purchase travel trips for a plurality of travelers for a plurality of predetermined travel links, each travel link comprising a travel origin and a travel destination, each travel link being served by at least one of a plurality of travel carriers, the system comprising:

a data input device for receiving travel information relating to the carriers and the links; 65

a data storage device for storing the travel information received by the data input device;

- a programmed processor for constructing an objective function from the travel information, the objective function representing a travel cost to the organization to purchase travel trips for the plurality of travelers for the plurality of predetermined links; and
- a programmed processor for constructing a set of constraints from the travel information, the constraints comprising restrictions relating to the objective function;
- the processor for applying the constraints to the objective function to determine a solution of the objective function that satisfies the constraints and that minimizes the travel costs the organization;
- the solution for being applied as the travel scheme for minimizing travel costs by purchasing travel trips in accordance with the solution.

36. The computer system of claim 35 wherein the travel information comprises travel cost information for each link for each carrier serving the link, demand and supply information pertaining to a projected demand for each link and a projected supply for each carrier, and carrier goal information pertaining to any predetermined goal the organization has with respect to any of the carriers.

37. The computer system of claim 36 wherein the processor determines from the travel cost information for each link for each carrier serving the link a weighted value representing an actual cost to the organization for traveling the link using the carrier.

38. The computer system of claim 37 wherein the objective function comprises the sum of a travel cost for each link, the travel cost for each link comprising the sum of a travel cost for each carrier serving the link, the travel cost for each carrier serving the link comprising the weighted value representing the actual cost to the organization for traveling the link using the carrier multiplied by a variable representing a number of trips to be purchased from the carrier for the link.

39. The computer system of claim 38 wherein the solution comprises a solution value for each variable.

40. The computer system of claim 39 wherein lower and upper limits for each constraint are determined by the processor, each constraint being adjustable between the limits while maintaining the determined solution.

41. The computer system of claim 39 wherein lower and upper limits for each solution value are determined by the processor, each solution value being adjustable between the limits while maintaining the determined solution.

42. The computer system of claim 38 wherein the constraints are derived from the demand and supply information and the carrier goal information, the constraints comprising link demand constraints, carrier supply constraints, and carrier goal constraints, the link demand constraints requiring that for each link the sum of the variables representing the number of trips to be purchased from all carriers for the link be equal to the projected demand for the link, each carrier supply constraint requiring that for a particular carrier the sum of the variables representing the number of trips to be purchased from the carrier for all links be in a predetermined range, each carrier goal constraint requiring that the goal the organization has with respect to a particular carrier be accomplished.

43. The computer system of claim 42 wherein the goal constraint comprises a predetermined discount from a particular carrier only if the carrier receives a minimum predetermined amount of business from the organization.

44. The computer system of claim 36 wherein the information retrieved by the processor is organized in the form of a table.

45. The computer system of claim 44 wherein the table is organized with each of the plurality of links laid out in a first direction and each of the plurality of carriers laid out in a second direction, each carrier serving each link being designated by a cell having information pertaining to the carrier serving the link. 5

46. The computer system of claim 45 wherein the link demand information is organized according to each link and wherein the carrier supply information and the carrier goal information is organized according to each carrier. 10

47. The computer system of claim 46 further comprising software for extracting information from the table to construct the objective function and the set of constraints and linear programming software for applying the constraints to the objective function to determine the solution. 15

48. The computer system of claim 47 wherein the solution is organized in the form of a table corresponding to the table of the obtained information.

49. The computer system of claim 36 further comprising a means for acquiring travel data from a computerized reservation system, wherein the travel cost information for each link for each carrier serving the link is compiled at least in part from the travel data. 20

50. The computer system of claim 36 further comprising a generated historical travel data file having historical travel data, wherein the travel cost information for each link for each carrier serving the link is compiled at least in part from the historical travel data. 25

51. The computer system of claim 36 further comprising a generated organization discount program data file having the demand and supply information and the carrier goal information for the organization. 30

52. The computer system of claim 36 wherein the travel cost information for each link for each carrier serving the link includes a member of the group selected from an expected fare the carrier charges for traveling the link, any discounts the carrier provides to the organization, any added costs in connection with traveling the link using the carrier, any benefits received in connection with traveling the link using the carrier, the number of non-stop voyages available, the number of connecting voyages available, any expected transfer delays, the percentage of total voyages the carrier provides for the link, and a combination thereof. 35 40

53. The computer system of claim 35 further comprising software executed on the processor for extracting information from the table to construct the objective function and the set of constraints and linear programming software for applying the constraints to the objective function to determine the solution. 45

54. A method for determining an optimum travel scheme for minimizing travel costs for traveling a plurality of travel links being served by a plurality of travel carriers by selectively allocating travel trips on each link to the carriers serving the link, comprising the steps of: 50

- (a) determining travel information representative of the links and the carriers serving the links; 55
- (b) determining constraints on allocating the trips to the carriers;
- (c) prospectively allocating the trips among the carriers in accordance with the travel information and the constraints to provide a travel scheme; 60
- (d) determining a cost of the travel scheme of step (c);
- (e) ascertaining whether any of the travel information or constraints have changed; 65
- (f) if any of the travel information or constraints have changed, then repeating steps (c), (d), and (e) until the

optimum travel scheme minimizing the travel costs in accordance with the travel information and the constraints is determined; and

(g) applying the optimum travel scheme to minimize travel costs by purchasing travel trips in accordance with such optimum travel scheme.

55. The method of claim 54 wherein the determining travel information step comprises the steps of:

obtaining travel cost information for each link for each carrier serving the link;

obtaining demand and supply information pertaining to a projected demand for each link and a projected supply for each carrier; and

obtaining carrier goal information pertaining to any predetermined goal the organization has with respect to any of the carriers.

56. The method of claim 55 further comprising the step of determining from the travel cost information for each link for each carrier serving the link a weighted value representing an actual cost to the organization for traveling the link using the carrier.

57. The method of claim 56 wherein the cost of the travel scheme comprises a function representing the sum of a travel cost for each link, the travel cost for each link comprising the sum of a travel cost for each carrier serving the link, the travel cost for each carrier serving the link comprising the weighted value representing the actual cost to the organization for traveling the link using the carrier multiplied by a variable representing a number of trips to be purchased from the carrier for the link.

58. The method of claim 57 wherein the optimum travel scheme comprises a solution value for each variable.

59. The method of claim 58 further comprising the step of determining lower and upper limits for each constraint, each constraint being adjustable between the limits while maintaining the optimum travel scheme.

60. The method of claim 58 further comprising the step of determining lower and upper limits for each solution value, each solution value being adjustable between the limits while maintaining the optimum travel scheme.

61. The method of claim 57 wherein the constraints are derived from the demand and supply information and the carrier goal information, the constraints comprising link demand constraints, carrier supply constraints, and carrier goal constraints, the link demand constraints requiring that for each link the sum of the variables representing the number of trips to be purchased from all carriers for the link be equal to the projected demand for the link, each carrier supply constraint requiring that for a particular carrier the sum of the variables representing the number of trips to be purchased from the carrier for all links be in a predetermined range, each carrier goal constraint requiring that the goal the organization has with respect to a particular carrier be accomplished.

62. The method of claim 55 further comprising the step of organizing the obtained information in the form of a table.

63. The method of claim 62 wherein the organizing step comprises organizing each of the plurality of links in a first direction on the table and each of the plurality of carriers in a second direction on the table, each carrier serving each link being designated by a cell on the table having information pertaining to the carrier serving the link.

64. The method of claim 63 wherein the organizing step further comprises organizing the link demand information according to each link and the carrier supply information and the carrier goal information according to each carrier.

65. The method of claim 64 further comprising the step of employing linear programming to apply the constraints to a

function representing the cost of the travel scheme to determine the optimum travel scheme.

66. The method of claim 65 further comprising the step of organizing the optimum travel scheme in the form of a table corresponding to the table of the obtained information. 5

67. The method of claim 55 wherein the obtaining travel cost information step comprises acquiring current travel data from a computerized reservation system.

68. The method of claim 55 wherein the obtaining travel cost information step comprises acquiring previously generated historical travel data from a historical travel data file. 10

69. The method of claim 55 wherein the obtaining demand and supply information and obtaining carrier goal information steps comprise acquiring the demand and supply information and the carrier goal information for the organization from a previously generated organization discount program data file.

70. The method of claim 54 further comprising the step of employing linear programming to determine a solution.

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2025 RELEASE UNDER E.O. 14176